Space Weather Forecast

Issued on Monday, 20 February 2023 at 01:13 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Moderate flares likely with an ongoing Strong flare potential. Coronal Mass Ejection arrival day 1 (20th), with a chance of G1/Minor Geomagnetic Storms.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low with only common class flares observed. There are nine sunspot regions, with the most noteworthy being a moderately sized and complex region in the northwest, with ongoing growth. This region also has some notable magnetic looping above the spot, adding to its potential eruptive nature. The other regions are all smaller and simpler, with the only other growth observed being largely limited to new and emergent regions, or a stable region that is now rotating away over the southwest horizon. Two coronal mass ejections (CMEs) were observed leaving the Sun from the southwest disc. These were due to lines of plasma, or filaments, lifting away from the Sun. The first was a clear miss, however the second, erupting from near a sunspot in the southwest has a small chance to give a glancing interaction late on day 3 or early day 4 (22nd or 23rd).

Solar Wind / Geomagnetic Activity: Solar winds showed a decline to background with speeds easing from around 400 km/s to near 300 km/s. The total Interplanetary Magnetic Field strength was Weak, with the north-south component also varying weakly. Geomagnetic activity was Quiet to Unsettled (Kp 0-3).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) was at background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity expected, with isolated Moderate-class flares likely, but also a chance of rising again to High with further Strong flares. The main risk for further significant flaring is the sunspot in the northeast that produced the Strong flare on the 17th.

Solar Wind / Geomagnetic Activity: CME associated with the strong flare on the 17th is anticipated to arrive early day 1 (20th) leading to elevated solar winds (500-600 km/s) being possible. The impact of any arrival is low confidence, however as most of the material is expected to miss. These winds then easing day 2 (21st), before a further slight enhancement occurs from the arrival of coronal hole sourced fast winds later day 2 or day 3 (22nd). There is a very low chance of a further CME glance later day 3 or day 4 (23rd), but currently not expected. Geomagnetic activity is forecast to rise on day 1 (20th) to be Active with a chance of G1 Minor Storms perhaps lasting into day 2 (21st), before easing to be Quiet to Unsettled. The further enhancement later day 2 or day 3 (22nd or 23rd) is expected to be relatively muted, perhaps bringing a spell of Active conditions, before easing again.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is most likely to remain at background levels, but with a slight chance of rising and exceeding the S1/Minor Storm level in response to any larger flares.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	40	20	10	10
Strong	G3	No	5	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	55	50	40	30
Very Active	R3 to R5 X	No	20	15	15	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	5	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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